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A REVIEW OF THE FISHES OF THE
GENUS SIGNALOSA

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REPORTS ON RESULTS OF
THE CAPTAIN MARSHALL FIELD EXPEDITIONS

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A REVIEW OF THE FISHES OF THE GENUS SIGNALOSA

BY ALFRED C. WEED

During parts of the summers of 1923 and 1924 important collections of fishes were made by Captain Marshall Field Expeditions in southeastern Louisiana mainly in the region about Lake Pontchartrain and in the "Brownsville Area" at the extreme southern corner of Texas. Special attention was paid to getting good series of specimens with accurate locality data for use in determining the value of observed variations in different groups. Much of the success of this work was due to the hearty cooperation of Mr. Percy Viosca, Jr. in Louisiana and of Mr. R. D. Camp at Brownsville. It is hoped that time and comparative material may be available to work out accurate studies of the variation and relationships of most of the groups represented in these collections.

The Brownsville area is a rather distinct division of the semi-arid belt which extends along the Gulf Coast from somewhere south of Galveston to the vicinity of Tampico. It seems that it is not the amount but the distribution of the rainfall that causes the arid conditions, because the rainfall at Brownsville averages about thirty inches a year, an amount which furnishes fairly good farming conditions in some regions. About seventy-five miles from Brownsville is an irregular ring of sandhills about ten miles wide, which seems to mark the shoreline of a bay which was later filled with silt from the Rio Grande. Northern species seem to have been stopped in their southward migration by this dune region. Perhaps it is not so well marked at the south, because Mexican species seem to have been able in many cases to enter the region but have not extended beyond it.

Conditions of fish life in the Brownsville area are rather peculiar. When the Rio Grande is in flood much of the area may be under water. At low water periods there are no streams and the fishes are confined to the resacas, tortuous flood plain channels; to the irrigation and drainage ditches; and to the shallow, semi-permanent lakes. The land is level and less than 100 feet above the Gulf of Mexico. Many of the lakes are salty or alkaline and all of them vary considerably in depth and area. Early in September, 1923, Laguna del Muerto was about three miles long, a mile wide and less than three feet deep. Marks on the trees showed that it had been at least two feet deeper at the time of the last rain. This lake was sufficiently permanent to be well filled

with waterlilies and there were extensive patches of cattails. A slightly longer drought in 1924 removed all the water and the lake bed was dry for several weeks.

In these saline or alkaline ponds a remarkable mixture of freshwater and saltwater species is found. A small pond about five miles north of Brownsville was an acre or two in area and seemed to represent the deepest part of a lake which may have been a quarter of a mile wide in places and several miles long. Seepage and evaporation had reduced it to the smaller dimensions in the course of a few months. The water was so dense with salt and alkali that a good swimmer could not put his hands on bottom in water five feet deep, except by climbing down the lead line of the net. Carp, *Carpoides*, characins, River Drum and Mullet (*Mugil*) were living there, apparently in good health. In Los Fresnos Resaca were caught Red Drum, Black Drum, Mullet, oceanic gars, Carp, River Carp (*Carpoides*), *Gobiosoma*, characins and cichlids in water too salty and alkaline to be pleasant to drink.

One of the most interesting points in the distribution of fishes in the Brownsville area is the immense number of Gizzard Shad (*Dorosoma* and *Signalosa*) found there. One haul was made across Resaca de la Guerra close to the buildings on Media Luna Ranch. A fifty-foot net which fished the whole depth of the water was hauled straight across the resaca, a distance of perhaps a hundred yards. When landed, the bag of the net was entirely filled with a mass of fish, practically all *Signalosa* less than three inches long. In point of bulk it was estimated that all other species, including gars up to three feet long and River Drum up to a foot and a half, made up about ten percent of the catch. Similar results were obtained in practically all places fished, except that *Dorosoma* usually made up about a third of the Gizzard Shad catch and in a borrow pit at the side of the road across Cross Lake there were hardly any *Signalosa* but many very small *Dorosoma*. The present writing seems to be the first to list *Signalosa* from the Brownsville region and even *Dorosoma* was not recorded from there prior to 1891 or 1892. It is difficult to imagine how so excessively abundant a group could have escaped detection for so long a time even though much of the collecting seems to have been incidental to other work. One would naturally suppose that the collectors of the Mexican Boundary Survey would have brought back hundreds of specimens, even if they had not collected anywhere except at Fort Brown and the resacas immediately northeast of it. There is more excuse for failure to bring back large series of adult *Signalosa* because there is much chance in the field to confuse them with half-grown *Dorosoma*. When they have been once

recognized they can be readily separated by the broad golden stripe of *Signalosa* and the pearly white of *Dorosoma*. A closer examination will show the essential differences in structure of the mouth in the two genera.

The genus *Signalosa* resembles *Dorosoma* in the structure of the stomach, in the numerous gill rakers (both related to feeding habits) and in the elongation of the last ray of the dorsal fin, a character which it shares with several unrelated groups of fishes. In other respects, especially the form and arrangement of the bones around the mouth, it resembles herrings related to *Alosa* and *Pomolobus*. This resemblance is especially notable in *Signalosa atchafalayae vanhyningi*.

Very few specimens properly referable to the genus *Signalosa* seem to have reached the museums of the world and these have had a rather varied experience so far as names are concerned. In the course of one of his expeditions to Central America, Mr. Osbert Salvin collected four small specimens in Lake Peten, Guatemala. Dr. Albert Günther described them in the Proceedings of the Zoological Society of London for 1866 under the name *Meletta petenensis*, giving the locality simply as "Lake Peten." In 1866, he redescribed them twice, once in the Catalogue of Fishes in the British Museum, where he gave the locality again as "Lake Peten"; and in the Transactions of the Zoological Society of London, where he gave a description of the lake which is sufficient to identify it as the large lake of that name in northern Guatemala, at the base of the Yucatan peninsula. In these latter descriptions he gave them the name *Chatoessus petenensis*. Mr. C. Tate Regan again described these specimens under the name *Dorosoma petenense* in 1908 in the *Biologia Centrali-Americana* and finally in 1917 he made a more complete description under the name *Signalosa petenensis* in the *Annals and Magazine of Natural History*. No other specimens have ever been recorded.

Lake Peten is a sinkhole lake of large size, situated in northern Guatemala about 17° north latitude and 90° west longitude. It has no visible outlet, but the character of its fauna seems to indicate the possibility that it has had a direct connection with some part of the Usumacinta River system.

In his collecting, M. Auguste Sallé seems to have made a short excursion into Mexico, spending most of his time at Cordoba, but making one trip to Mt. Orizaba. Some of his specimens were later sold to the British Museum, among them two specimens labeled "Mexico," which Günther described in the Catalogue of Fishes in the British Museum, under the name *Chatoessus mexicanus*. As M. Sallé seems to have made only the single Mexican expedition, we may conclude that the specimens

were collected in the Rio Blanco basin, somewhere in the vicinity of Cordoba. In addition to these two specimens, Günther reported that he had a small specimen from New Orleans and several which were supposed to have come from Boero, East Indies. Mr. C. Tate Regan redescribed the species in 1917 under the name *Signalosa mexicana*. He reported that he had nine specimens and included *Signalosa atchafalayae* Evermann and Kendall. His published description shows that the specimens were all or mostly southern. Meanwhile, the late Dr. S. E. Meek had collected a fairly large series in the Rio Papaloapam basin in Vera Cruz and Oaxaca, Mexico, and reported on them (1904) under the name *Signalosa mexicana*, indicating that he considered *Signalosa atchafalayae* Evermann and Kendall a synonym.

Rio Papaloapam is the next large stream system flowing into the Gulf of Mexico south of the Rio Blanco and we may expect its fish fauna to be very similar. In fact these small Gizzard Shad collected by Meek agree so closely with the published descriptions of *Signalosa mexicana* that we may consider them to have come from close to the type locality.

Evermann and Kendall, in 1898 published a description of several specimens taken in Louisiana and Mississippi, under the name *Signalosa atchafalayae*, new genus and species. This was redescribed the same year under the same name by Jordan and Evermann, and the next year by Dr. Evermann. Both Meek and Regan later included it in the synonymy of *Signalosa mexicana*.

The present study shows the propriety of considering all three as valid species and adds two new names, *vanhyningi* and *campi*. The former is based on four specimens collected in a prairie creek six miles southeast of Gainesville, Florida, by Mr. O. C. Van Hyning and is doubtfully referred as a subspecies of *atchafalayae*. The subspecies *campi* is based on several thousand specimens collected by the author and Mr. R. D. Camp in the vicinity of Brownsville, Texas. It is plainly very closely related to the specimens collected by Meek in the Rio Papaloapam basin, but shows constant average differences which seem to entitle it to subspecific rank.

All measurements in these descriptions are given as decimals of the "standard length," the distance from the tip of the snout to the end of the last caudal vertebrae (in practice, to the base of the first caudal rays). Where the last ray of a fin is divided to its base but seems to be articulated to a single interhaemal or interneural, it is counted as one. No rudimentary ray at the front of a fin is counted unless it reaches more than three-fourths as high as the first branched ray.

Scales are not counted because they seem to have little diagnostic value here and in the *mexicana* group are so deciduous that the probable error of the count is greater than the total variation in the genus. The number of scutes behind the ventrals has been used as a criterion but proves to be less reliable than the total number because that seems to have a definite relation to the number of muscle segments while the exact position of the ventral fins is more or less accidental and may be in any one of three or four segments. Slight differences in muscular tension may make considerable changes in the relative positions of dorsal and ventral fins because the pelvic bones are not articulated to anything except the fins and lie free in the muscles of the belly wall. Considerable motion forward and back is possible and usual.

Signalosa Evermann and Kendall.

Signalosa EVERMANN and KENDALL, Bull. U. S. Fish Comm. 1897, (Feb. 9, 1898), p. 127; JORDAN and EVERMANN, Bull. 47, U. S. Nat. Mus., 3, p. 2809, Nov. 26, 1898; MEEK, Field Col. Mus., Zool. Ser., 5, p. 94, August, 1904; REGAN, Ann. & Mag. Nat. Hist., (8), 19, p. 310, April 1917.

Mouth toothless, terminal, oblique, the lower jaw projecting; maxillary without notch, reaching front of eye; snout short, not overhanging; gill rakers long and numerous; stomach gizzard-like; scales large; last ray of dorsal produced in a filament which about reaches base of caudal fin; belly compressed and armed with bony scutes.

The genus *Signalosa* is found along the entire coast of the Gulf of Mexico, from Florida to the Yucatan Peninsula. It seems to be strictly confined to the lowlands, not being found above an elevation of five hundred feet and not entering the Gulf or the estuaries behind the sea islands. *S. petenense* seems to be the only form that is found more than two to three hundred feet above sea level.

KEY TO THE SPECIES AND SUBSPECIES OF SIGNALOSA.

- A. Abdominal scutes usually less than 27, scales deciduous.
 - B. Scutes behind origin of ventral fins 11-12, Lake Peten, Guatemala..... *petenensis*.
 - BB. Scutes behind origin of ventral fins 8-11; golden color on sides. Rio Grande basin to Rio Papaloapam..... *mexicana*.
 - C. Scutes behind ventral fins averaging 9; golden color on sides of head and shoulder; head moderate. Rio Papaloapam and Rio Blanco, Mexico *mexicana mexicana*.

- CC. Scutes behind ventral fins averaging 9-10; golden color in a broad band entire length of side; head large, Rio Grande delta, Texas..... *mexicana campi*.
- AA. Abdominal scutes usually more than 26; scales not very deciduous, no golden band on sides. Louisiana to Florida... *atchafalayae*.
 - D. Head moderate. Mississippi and Louisiana.
 - *atchafalayae atchafalayae*.
 - DD. Head small. Central Florida.
 - *atchafalayae vanhyningi*.

Signalosa petenensis (Günther).

Meletta petenensis GÜNTHER, Proc. Zool. Soc. London, 1866, p. 603, March 1867.

Chatoessus petenensis GÜNTHER, Cat. Fish Brit. Mus., 7, p. 408, 1868; Trans. Zool. Soc. London, 6, p. 488, 1868.

Dorosoma petenense JORDAN and EVERMANN, Bull. 47, U. S. Nat. Mus., 1, p. 417, Oct. 3, 1896; REGAN, Biol. Cent. Amer., Pisces, p. 178, Feb. 1908.

Signalosa petenensis REGAN, Ann. & Mag. Nat. Hist., (8), 19, p. 310, April 1917.

D. 14-15 (15-16)¹; A. 20-23 (21-24)¹; scales 40-43; head .277-.313 (3 1/5 - 3 2/5), average about .29 (3 1/2); depth .333-.371 (2 3/4-3); abdominal scutes 14-16+10-12. Ventral fins inserted below or slightly behind dorsal, gill rakers on lower limb of first arch 160, color silvery, a dark humeral spot.

The above description is compiled from published notices by Günther and Regan. Only four specimens are known, collected in Lake Peten by Osbert Salvin between 1860 and 1865.

Signalosa mexicana mexicana (Günther).

Chatoessus mexicanus GÜNTHER, Cat. Fish Brit. Mus., 7, p. 409, 1868.

Dorosoma mexicanum JORDAN and GILBERT, Bull. 16, U. S. Nat. Mus., p. 887, 1882; JORDAN and EVERMANN, Bull. 47, U. S. Nat. Mus., 1, p. 416, Oct. 3, 1896; MEEK, Field Col. Mus., Zool. Ser., 3, p. 87, May, 1902.

¹ Differences in counting number of fin rays due to different interpretations of the same specimens.

Signalosa mexicana MEEK, Field Col. Mus., Zool. Ser., 5, p. 94, August 1904 (part); REGAN, Biol. Cent. Amer., Pisces, p. 178, Feb. 1908 (part); Ann. & Mag. Nat. Hist., (8), 19, p. 310, April, 1917 (part).

D. 11-12, average 11.5; A. 23-27, average 25.1; scales not counted; head .27-.36, average .298 ($3\frac{1}{3}$); depth .35-.41, average .376 ($2\frac{2}{3}$); eye .09-.11, average .098¹; scutes before ventrals 13-17, average 15.5; scutes behind ventrals 8-11, average 9.1; total scutes 22-27, average 24.6. Color silvery, with a dark humeral spot. Meek (l.c., p. 94) mentions that there is much golden color on the opercular regions, this forming a broad golden band from snout to tail and covering about one-third of the side in *S. m. campi*. This color mostly disappears in preserved specimens.

This description is made from 22 specimens collected by Dr. S. E. Meek at various points in the drainage area of Rio Papaloapam in the states of Vera Cruz and Oaxaca, Mexico.

Signalosa mexicana campi subsp. nov. "Shad."

Type from Resaca de la Guerra, on or near Media Luna Ranch, Brownsville, Texas. No. 11413, F.M.N.H., 59 mm. long to base of tail. Collected August 17, 1923, by A. C. Weed and R. D. Camp.

D. extreme variation 10-14, usual variation 11-12, average 11.6; A. extreme variation 19-28, usual variation 20-25, average 22.6; scales too deciduous to attempt an accurate count; head, extreme variation .31-.38, usual variation .32-.36, average .341²; depth, extreme variation .28-.39, usual variation .32-.36, average .337; eye, extreme variation .10-.15, usual variation .10-.14, average .120; scutes before ventrals, extreme variation 11-17, usual variation 14-16, average 14.95; scutes behind ventrals, extreme variation 8-12, usual variation 9-11, average 9.7; total scutes, extreme variation 20-27, usual variation 23-26, average 24.7. Color of back, greenish golden olivaceous, with much pearly luster; sides pearly white with a broad band of brilliant gold, covering about one-third of the depth of the fish; occasionally this band narrower or divided into two stripes, each about as wide as the eye and separated by a paler interspace of the same width. Specimens from a brackish

¹ The length of the eye in relation to the length of the head seems to have much less significance in *Signalosa* than in many other groups. The absolute length as a decimal of the standard length is given here so that the other relations may be determined in cases where they have value.

² Measurements of head and depth are somewhat misleading in this subspecies because of the small size of the specimens. However, it is plainly evident that, at comparable sizes, *campi* is more slender and has a longer head than *mexicana*.

pool about five miles north of the Brownsville sugar mill had an additional horizontal golden band well up on the shoulder. In general, we found the color more brilliant in the waters which carried a noticeable percentage of salt and alkali. Most of the color disappears in the preservative.

This description is compiled from the measurements of five hundred specimens taken in the Rio Grande Delta, north of Brownsville, Texas. More than three hundred were taken in two localities in Resaca de la Guerra (also called Resaca de la Palma), just outside of Brownsville. About one hundred were taken in Los Fresnos Resaca about twenty miles farther north. Fifty-nine were taken in a brackish and alkaline pond about five miles north of the Brownsville sugar mill. Twenty-six were taken in Resaca de la Rancho Viejo about opposite the ten mile post on the cement road north from Brownsville. Some say that this last is part of Resaca de la Guerra, others that the two are separate bodies of water which come very close together within a short distance of where the collecting was done.

This subspecies is very close to *S. m. mexicana*, but seems to be distinguished in average measurements by a longer head, more slender body, shorter anal fin and by having the ventral fins placed slightly farther forward in relation to the abdominal scutes. The total number of scutes is the same in both, but *mexicana* seems to have 15-16 scutes before the ventrals and 9 behind, while *campi* has 15 before and 9-10 behind.

I take pleasure in naming this fish for Mr. R. D. Camp, who gave generously both of time and advice in making my visits to Brownsville and vicinity pleasant and profitable.

Signalosa atchafalaya *atchafalaya* Evermann and Kendall.

Signalosa atchafalaya EVERMANN and KENDALL, Bull. U. S. Fish Comm., 17, 1897, p. 127, pl. 7, fig. 4, Feb. 9, 1898; JORDAN and EVERMANN, Bull. 47, U. S. Nat. Mus., 3, p. 2809, pl. LXIX, fig. 184, Nov. 26, 1898; EVERMANN, Rept. U. S. Fish Comm., 1898, p. 309, pl. 21, 1899.

Signalosa mexicana MEEK, Field Col. Mus., Zool. Ser., 5, p. 94, August 1904 (part); REGAN, Biol. Cent. Amer., Pisces, p. 178, Feb. 1908 (part); Ann. & Mag. Nat. Hist., (8), 19, p. 310, April 1917 (part).

D. 11-13, average 12.1; A. 20-28, average 23.5; scales not counted; head .28-.32, average .303; depth .35-.40, average .378; eye .07-.10,

average .088; scutes before ventrals 16-17, average 16.5; scutes behind ventrals 10-12, average 11.2; total scutes 26-29, average 27.7. This species seems to lack the golden lateral band of *S. mexicana*, but is otherwise similar in coloration to the other members of the genus and bears the black humeral spot, which seems to be a family character.

Described from ten specimens collected in Louisiana by Mr. Percy Viosca, Jr. Various authors have united *atchafalayae* with *mexicana*, apparently on the basis of the comparison of a small number of specimens or else as a result of comparing a few specimens with printed descriptions. Comparison of our small series of *atchafalayae* with the large series of *campi* seems to show that the former has the scales much less deciduous, lacks the golden lateral band and has a larger number of abdominal scutes. It is probable that an examination of an adequate number of specimens from Louisiana would show that the extreme variation overlaps somewhat, as is to be expected in forms which are obviously so closely related, but it is also probable that such a series would show a clear separation in average measurements.

The study of these specimens shows clearly that it is not enough to count the number of abdominal scutes behind the ventral fins, although there is a clear separation in average numbers between *mexicana* and *atchafalayae*. It is necessary to count the total number because the point where the fins divide the series is somewhat variable. It seems probable that an examination of enough specimens will show that the usual variation in the total number of scutes is from 23 to 26 in *mexicana* and from 27 to 29 in *atchafalayae*.

Signalosa atchafalayae vanhyningi subsp. nov. "Shiner," "Hickory Shad."

Type from Prairie Creek, 6 miles southeast of Gainesville, Florida. No. 11395, F.M.N.H., 81 mm. long to base of tail. Collected Feb. 1, 1925, by O. C. Van Hyning.

D. 13; A. 22-26, average 24.8 (probably too low); scales not counted; head .25-.27, average .258; depth .33-.37, average .348; eye .08-.09, average .089; scutes before ventrals 16; scutes behind ventrals 11-12, average 11.8; total scutes 27-28, average 27.75. Color pearly white on the sides, dark on the back, with the usual black humeral spot. In the preserved specimens there is no indication of the golden lateral band, which is so conspicuous in specimens from the lower Rio Grande region.

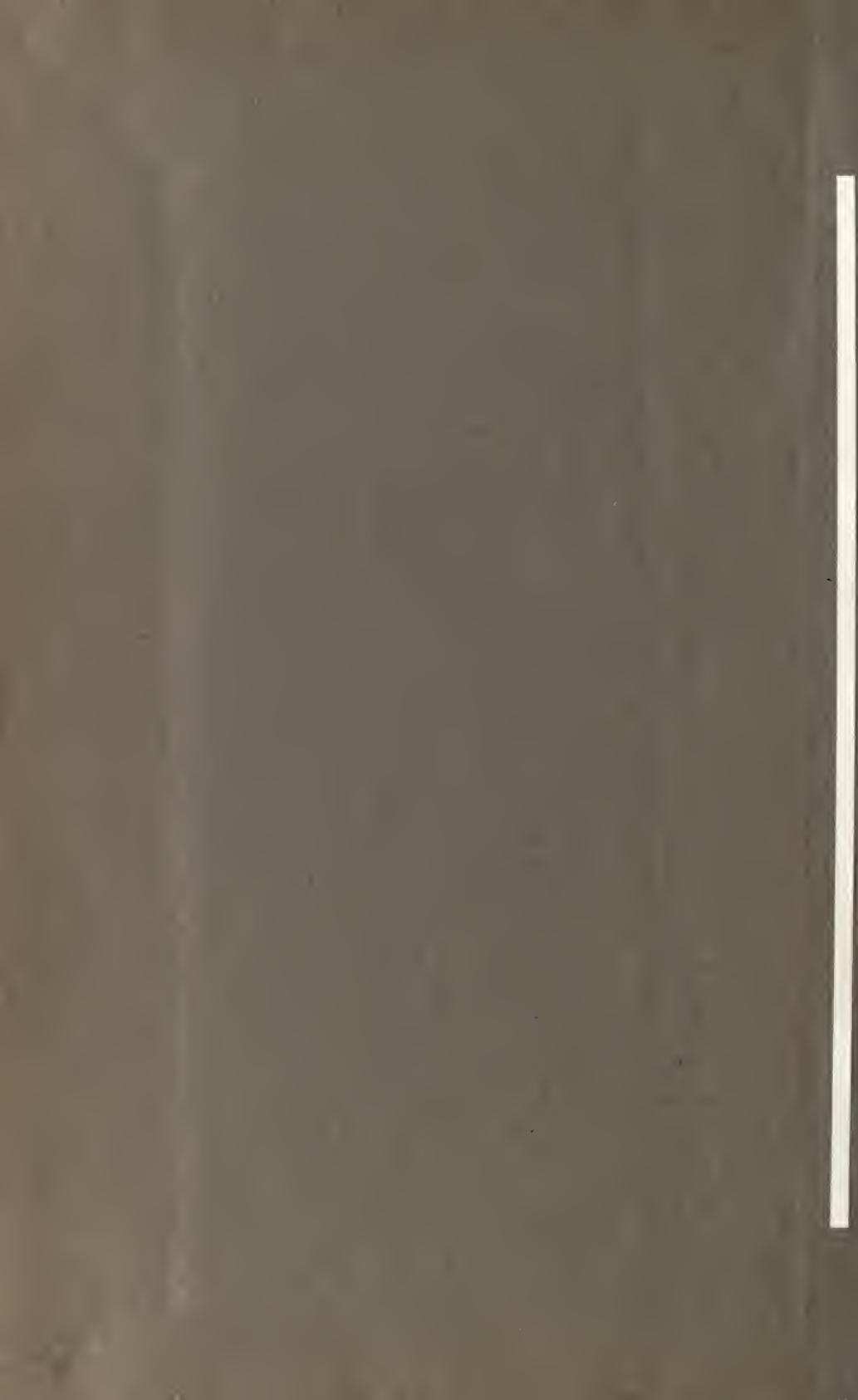
Described from four specimens collected in a prairie creek, six miles southeast of Gainesville, Florida, Feb. 1, 1925, by Mr. O. C. Van Hyning.

In number and relative position of scutes, this subspecies is very closely related to *atchafalayaë*. It differs from that subspecies in having a much smaller head and slightly longer dorsal. The number of anal rays is so variable in *Signalosa* that no distinctive characters can be secured from the small number of specimens at hand. There are some indications that the Florida form may be entitled to specific rank when adequate study material is secured. The size of the eye, in relation to the length of the head will probably have a diagnostic value in this group. The eye has the same length in relation to length of body in both but the head being so much larger in one than in the other makes the eye 3.44 in head in *atchafalayaë* and 2.9 in head in *vanhynningi*.

I take pleasure in naming this fish for Mr. O. C. Van Hyning, who has collected some very interesting specimens in the vicinity of Gainesville, Florida.







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